

Economic Feasibility of a Proposed Redclaw Crayfish Farm Utilizing Geothermal Water as an Energy Resource



**Idaho Department of Water Resources
Energy Division
Boise, Idaho
November 2004**



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**Department of Agricultural Economics and Rural Sociology
A.E. Extension Series No. 04-09**

November 17, 2004

Funding for this study was provided by

**The U.S. Department of Energy through The Idaho Department of
Water Resources-Energy Division
Grant No. DE-FG51-03R021489M001,**

U.S. Economic Development Administration,

and

The University of Idaho

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ACKNOWLEDGEMENT

This report was prepared by the staff of the University of Idaho, Department of Agricultural Economics and Rural Sociology, in cooperation with the Idaho Department of Water Resources, Energy Division. Funds were provided by the U.S. Department of Energy through the Idaho Department of Water Resources, the U.S. Economic Development Administration, and the University of Idaho.

Costs associated with this publication are available from the Idaho Department of Water Resources in accordance with Section 60-202, Idaho Code. IDWR November 2004.

Executive Summary

This paper presents results of a feasibility analysis of a proposed aquaculture operation that will produce primarily Australian Redclaw Crayfish and utilize geothermal water as an energy resource. Expected revenues, costs, and profits over a ten-year time period are estimated in projected income statements. A supplemental investment analysis has been included as a measure of long-term profitability of the operation. The ability of the operation to generate sufficient cash flow is summarized in a statement of projected cash flows over the ten-year time period. The report also includes a discussion of key factors that are crucial in a successful entrepreneurial endeavor.

The following are key findings from the analysis:

The projected redclaw crayfish farm will likely be profitable and have sufficient cash flows over the ten-year analysis period.

Year	Net Income After Taxes and Dividends Paid	Cash Flow	Cash Balance at End of Year
1	\$ 5,870.65	\$ 14,761.01	\$ 14,761.01
2	\$ 7,102.40	\$ 13,814.34	\$ 28,575.35
3	\$ 8,286.15	\$ 12,601.83	\$ 41,177.18
4	\$ 9,588.28	\$ 11,268.07	\$ 52,445.25
5	\$ 11,020.62	\$ 9,800.94	\$ 62,246.19
6	\$ 12,596.19	\$ 8,187.09	\$ 70,433.27
7	\$ 14,329.33	\$ 6,411.85	\$ 76,845.13
8	\$ 16,235.77	\$ 4,459.10	\$ 81,304.23
9	\$ 18,332.87	\$ 2,311.06	\$ 83,615.29
10	\$ 20,639.67	\$ (51.77)	\$ 83,563.52

Developing a business plan would help the proposed redclaw crayfish operation address other key management factors that contribute to start-up business success or failure.

Factors that must be addressed to ensure long-term sustainability of any business include:

- technical/operations management
- marketing
- legal documentation of business structure and organization
- financial management
- risk assessment and management strategy

A business plan would address all key factors of start-up business success and provide the documentation necessary to secure outside funding. Completion of a business plan is recommended before further investments are made.

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Project Definition

This report estimates and summarizes the expected costs and returns for a proposed aquaculture operation producing primarily Australian Redclaw Crayfish. The Idaho Redclaw Farms, Limited Liability Company facility will be located approximately 15 miles south of Malta, adjacent to the new U.S. Geothermal 10 MW power plant currently under development. Initially, the operation will raise redclaw crayfish in indoor tanks using an existing geothermal well as the heat source. When the U.S. Geothermal power plant comes on-line, the facility will utilize waste heat from geothermal water used to operate the power plant. Once the operation reaches full production capacity, it will produce approximately 13,800 pounds of crayfish for sale on an annual basis.

Background and Assumptions

Australian Redclaw Crayfish is one of 100 freshwater species of crayfish native to Australia. Three of these species (marron, yabbie, and redclaw) grow to over one pound, making them of significant interest to the aquaculture industry. The redclaw is the most suitable for commercial production because of its relatively rapid maturation rate and non-aggressive behavior. It is similar to North American crayfish in anatomy, reproduction, and feeding habits. However, redclaw has a larger potential size, higher dress-out percentage, multiple annual spawnings and higher fertility rate, is non-burrowing, and tolerates crowded culture conditions with a low incidence of cannibalism compared to native species.¹

Redclaw crayfish are likely susceptible to diseases of native crayfish, and are known to be susceptible to the “crawfish plague” – a fungal pathogen – with no known treatment or prevention methods. If a disease is introduced to a population of redclaw, it is likely the entire population will be devastated. There are no antibiotic treatments approved for redclaw crayfish at this time, making disease prevention the key to reducing mortalities. Primary disease exposure sources are water contaminated by native crayfish and droppings of birds that have consumed contaminated crayfish.² The proposed aquaculture facility will be an entirely enclosed operation with closed circuit freshwater cycling through biofilters, thus reducing the risk of disease introduction.³

In order to complete the feasibility analysis of the proposed operation, a number of assumptions were made. They are listed below.

1. 1000 square feet of production building space will produce 1000 pounds of product annually.
2. Investment and maintenance cost of geothermal heating structures in the new buildings will be similar to the estimated cost in the existing 2500 square feet steel building, for which a geothermal engineering study was completed.⁴
3. An interest rate of 10 percent was used to reflect the cost of investment capital. A portion of the investment capital will be raised through LLC member-partner contributions, with the remainder being generated from borrowed money. Financial institutions will likely charge an interest rate significantly above the prime rate to account for the risk associated with an entrepreneurial business venture, no financial history, and the relatively new nature of the product, both in terms of marketing and commercial production in the United States. For the same reasons, interest returned to investment capital from

member-partner contributions should be approximately the same as the rate for borrowed capital. Thus, an interest rate of 10 percent was selected for the purposes of this analysis.

4. The life of the investment is 10 years. While many of the buildings and structures may have a life beyond 10 years, other investment items (truck and trailer) have lives of less than 10 years. Also, by the time the buildings and structures are 10 years old, significant investment costs will be required to assure continued proper performance and productivity. Thus a life of 10 years was selected for the purposes of this analysis.

Geothermal and Operational Considerations

An engineering study outlining the technical and investment requirements to utilize the geothermal resource to heat the aquaculture water and space of the facility was completed by Kevin Rafferty for the initial phase of the operation. The initial phase of the operation will develop breeding stock, an initial hatchery crop, and grow-out of a small crop of redclaw crayfish for sale in an existing 2500 square foot insulated steel building. The second phase will add building space and facilities to reach full capacity of the entire proposed 15,300 square foot area. The initial facility will later be used entirely for breeding stock and hatchery operations with the grow-out operation located within the additional 13,800 square feet of facilities added in the second phase.

Analysis of the economic feasibility of the operation at full production is based on the estimates developed in the initial engineering study. The analysis assumes that the geothermal resource (waste geothermal water from the power plant) will be adequate in flow and temperature to heat the proposed aquaculture operation at full production capacity. Additionally, the investment cost required for full production capacity is assumed to have the same cost factor per square foot as the investment required for just the hatchery portion of the operation. A similar factor was also used to estimate maintenance costs of the geothermal heating structures. For more technical information regarding the layout and design of the proposed facility, refer to Freshwater Aquaculture Geothermal Feasibility Study: Raft River, ID, by Kevin Rafferty⁴.

Economic Feasibility

Economic feasibility is determined by long-term profitability and positive cash inflows sufficient to meet necessary cash outflows (expenditures) at any given time. Profitability can be measured using projected net income and investment analysis. Projected cash flows are measured and summarized. Necessary information to complete each of these analyses includes: projected revenues, investment costs, and operation costs. A discussion of how the estimates were made and what they include can be found in Appendix A.

Revenue

Retail value of the crayfish is estimated as \$20 per pound based on current market information.⁵ Marketing, packing, and distribution costs are expected to equal \$5 per pound,⁶ resulting in a wholesale price (value to the aquaculture operation) of \$15 per pound.

Investment Costs

Primary investment costs consist of the renovation of an existing insulated steel building on-site, construction of new housing facilities (greenhouses), tank and filtering structures, geothermal heating structures, and purchasing a truck and trailer for transporting the product to local markets and to an external marketing and distribution location. Estimates of the investment costs and expected annual depreciation are provided in Table 1. A 10 percent contingency factor is included in all of the investment cost items. Annual depreciation was calculated assuming 10 year lives for all investment items using the straight-line depreciation method and the following salvage values: tank and filtering structures - \$0, buildings – 20 percent of investment cost, geothermal structures – 10 percent of investment cost, and truck/trailer – 5 percent of investment cost.

Total estimated investment cost for the proposed aquaculture operation is \$347,184 with annual

Table 1. Estimated Investment Requirements and Annual Depreciation Charges for Idaho Redclaw Facility (15,300 sq ft)		
Item	Investment (\$)	Annual Depreciation (\$)
Tank and Filtering Structures	\$ 44,000	\$ 4,400
<i>Repro/Hatchery</i>	\$ 16,500	\$ 1,650
<i>Growout</i>	\$ 27,500	\$ 2,750
Planned Buildings	\$ 101,200	\$ 8,096
<i>2 Used Greenhouses</i>	\$ 13,200	\$ 1,056
<i>Aqua Care Greenhouse</i>	\$ 88,000	\$ 7,040
Existing Building Renovation	\$ 20,000	\$ 1,600
Geothermal Heating Structures ⁵	\$ 141,984	\$ 12,778
Truck and Trailer	\$ 40,000	\$ 3,800
Total	\$ 347,184	\$ 30,675

depreciation of \$30,675 per year. It is assumed that investment costs will be financed through a financial institution with the remaining balance to be financed through capital contributions from the member-partners of the LLC. Annual payments of equal amounts will be made over the 10-year

period to pay off the debt. An interest rate of 10 percent was assumed to calculate the annual payment of \$56,502.60. Annual ownership costs (composed of depreciation and interest expense) decline over the 10-year period; totaling \$65,393 in year one and \$35,811 in year ten. This occurs because interest expense declines over the 10-year period as the principal portion of the debt is paid off.

Operation Costs

Operating costs are summarized in Table 2. Utilities include phone, electricity, and the cost of the geothermal water. Annual repair and maintenance costs were calculated using 2 percent of the investment cost of the tank, filtering, and geothermal heating structures. Management and labor cost items include employment taxes that must be paid by the business as well as direct salaries and wages. A contingency cost is included in the operating costs to account for uncertainty in the utilities, repairs and maintenance, feed, fuel, breeding stock replenishment, insurance, attorney fees, and permits and licensing cost items. The contingency cost was calculated by using a factor of 5 percent and applying it to the operating costs listed as uncertain. Total operating costs are estimated to be \$129,408 annually, resulting in an operating cost per pound of \$9.38.

Table 2. Estimated Annual Operating Costs for Idaho Redclaw Facility (15,300 sq feet)	
Item	Cost (\$)
Lease	\$ 36,000
Utilities	\$ 9,600
Repair/Maintenance	\$ 3,720
Labor	\$ 24,546
Management	\$ 39,337
Feed	\$ 2,400
Fuel	\$ 6,000
Breeding Stock Replenishment	\$ 200
Insurance	\$ 3,000
Attorney Fees	\$ 3,000
Permits and Licensing	\$ 200
Contingency	\$ 1,406
Total Operating Costs	\$ 129,408
Operating Cost per Pound of Production	\$ 9.38

Profitability Analysis

Profitability of the proposed operation is examined for both short-run and long-run scenarios. Projected income statements for each year of a 10-year period were constructed based on the above information to examine the profitability of the operation in each year (Appendix B). Table 3 provides a summary of the performance of the operation as measured by net income over the 10-year period.

The operation generates a positive net income each year of the analysis. Net income before taxes increases each year over the life of the investment. This occurs because the interest expense portion of ownership costs declines over the period of the analysis. Likewise, taxes and dividend

payments increase as net income increases. Taxes were estimated using a 35 percent corporate tax rate applied to net income before taxes. Dividends paid to the member-partners of the LLC were estimated to be 24 percent of after-tax profits. Net income after taxes and dividends paid also increases over the 10-year period from \$5,871 in year one to \$20,640 in year ten. This indicates that the business will be profitable in the short-run. In other words, it should generate a profit each year of operation, barring any unforeseen occurrences.

Table 3. Projected Net Income for Idaho Redclaw Facility (15,300 sq ft)							
Year	Revenues	Operation Costs	Ownership Costs	Net Income Before Taxes	Taxes	Dividend Payments	Net Income After Taxes and Dividends Paid
1	\$ 207,000.00	\$ 129,723.14	\$ 65,392.96	\$ 11,883.90	\$ 4,159.37	\$ 1,853.89	\$ 5,870.65
2	\$ 207,000.00	\$ 129,408.14	\$ 63,214.54	\$ 14,377.32	\$ 5,032.06	\$ 2,242.86	\$ 7,102.40
3	\$ 207,000.00	\$ 129,408.14	\$ 60,818.28	\$ 16,773.58	\$ 5,870.75	\$ 2,616.68	\$ 8,286.15
4	\$ 207,000.00	\$ 129,408.14	\$ 58,182.39	\$ 19,409.47	\$ 6,793.31	\$ 3,027.88	\$ 9,588.28
5	\$ 207,000.00	\$ 129,408.14	\$ 55,282.91	\$ 22,308.95	\$ 7,808.13	\$ 3,480.20	\$ 11,020.62
6	\$ 207,000.00	\$ 129,408.14	\$ 52,093.49	\$ 25,498.37	\$ 8,924.43	\$ 3,977.75	\$ 12,596.19
7	\$ 207,000.00	\$ 129,408.14	\$ 48,585.12	\$ 29,006.74	\$ 10,152.36	\$ 4,525.05	\$ 14,329.33
8	\$ 207,000.00	\$ 129,408.14	\$ 44,725.92	\$ 32,865.94	\$ 11,503.08	\$ 5,127.09	\$ 16,235.77
9	\$ 207,000.00	\$ 129,408.14	\$ 40,480.80	\$ 37,111.06	\$ 12,988.87	\$ 5,789.33	\$ 18,332.87
10	\$ 207,000.00	\$ 129,408.14	\$ 35,811.16	\$ 41,780.70	\$ 14,623.25	\$ 6,517.79	\$ 20,639.67

Given that the operation generates a positive net income each year, it would be easy to assume that the business is a profitable investment in the long-term (over the life of the investment). However, that is not necessarily true. Investment analysis is a common way to determine long-

term profitability. Two common measures of profitability used in investment analysis are: net present value and internal rate of return.

Net present value gives the present value of net cash flows that result from an investment less the cost of the initial investment, given a specified discount rate. (Present value is defined as the current value of future costs or revenues.)

Criterion for net present value analysis: Net present value is greater than zero.

The discount rate in net present value analysis represents the time value of money plus any inflationary factors. The revenues and costs developed for this analysis are stated in present value terms. Thus the discount rate used will only account for the time value of money, set at three percent for the purposes of this analysis. The initial investment cost is \$347,184.

A summary of the results of the net present value analysis is presented in Table 4. A positive net present value of the investment equal to \$77,081.61 is projected.

Table 4. Net Present Value Analysis of Idaho Redclaw Facility (15,300 sq feet)

Year	Expenditure/ Revenues	Discount Rate	Present Value
0	\$(347,184.00)	0.03	\$(347,184.00)
1	\$ 38,399.10	0.03	\$ 37,280.67
2	\$ 40,019.82	0.03	\$ 37,722.52
3	\$ 41,577.39	0.03	\$ 38,049.20
4	\$ 43,290.72	0.03	\$ 38,463.24
5	\$ 45,175.37	0.03	\$ 38,968.68
6	\$ 47,248.50	0.03	\$ 39,569.88
7	\$ 49,528.94	0.03	\$ 40,271.56
8	\$ 52,037.42	0.03	\$ 41,078.82
9	\$ 54,796.75	0.03	\$ 41,997.15
10	\$ 95,235.15	0.03	\$ 70,863.90
Net Present Value			\$ 77,081.61

A second measure of the profitability of an investment is the internal rate of return, which measures the rate of return on an investment, accounting for the time value of money. The internal rate of return on the investment for this operation is 6.6 percent. Again, this value is expressed in *real terms*.ⁱ The rate of return indicates how much the investment returns to cover the opportunity cost of money (usually the return that could be expected if the money were invested in a “second best” alternative) and the risk and uncertainty of the investment. For this reason, the investment rate of return is commonly compared to an industry rate of return. Rates of return for agricultural and

aquaculture operations are generally lower than in other industries. An aquaculture operation with a known market and known production risks (able to incorporate risk and uncertainty into cost) that generates a 6.6% return would probably be acceptable. However, given the lack of knowledge about risk and uncertainty of the proposed operation, a 6.6% return may not be sufficient. This determination must be made by the manager/operator and investors.

One other evaluation of an investment is the payback period, which simply measures the number of years it would take an investment to return its original cost through annual net revenues. This method does not measure profitability. Rather, it measures the timing of when an investment

ⁱ The internal rate of return does not include any inflationary factors, and thus should be compared to a *real* market rate of return.

will begin to contribute to the liquidity of the business. The payback period for this investment is 7.6 years.

Cash Flow Analysis

The timing of cash inflows (cash receipts) and outflows (cash expenses) is important to the financial feasibility of an investment. Taking out operating loans to sustain a business during cash shortages increases interest expenses and ultimately can affect the profitability of the investment. The ability of a business to match its cash outflows to cash inflows is crucial to its sustainability. A projected statement of cash flows for each year was developed using the revenues, operating expenses, annual investment payment, taxes, and dividends estimated for the proposed redclaw crayfish operation. Table 5 summarizes the results of the cash flow analysis.

Table 5. Projected Cash Flows for Idaho Redclaw Facility (15,300 sq feet)							
Year	Revenues	Operating Expenses	Annual Investment Payment	Taxes	Dividend Payments	Cash Flow	Balance at End of Year
1	\$ 207,000.00	\$ 129,723.14	\$ 56,502.60	\$ 4,159.37	\$ 1,853.89	\$ 14,761.01	\$ 14,761.01
2	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 5,032.06	\$ 2,242.86	\$ 13,814.34	\$ 28,575.35
3	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 5,870.75	\$ 2,616.68	\$ 12,601.83	\$ 41,177.18
4	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 6,793.31	\$ 3,027.88	\$ 11,268.07	\$ 52,445.25
5	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 7,808.13	\$ 3,480.20	\$ 9,800.94	\$ 62,246.19
6	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 8,924.43	\$ 3,977.75	\$ 8,187.09	\$ 70,433.27
7	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 10,152.36	\$ 4,525.05	\$ 6,411.85	\$ 76,845.13
8	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 11,503.08	\$ 5,127.09	\$ 4,459.10	\$ 81,304.23
9	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 12,988.87	\$ 5,789.33	\$ 2,311.06	\$ 83,615.29
10	\$ 207,000.00	\$ 129,408.14	\$ 56,502.60	\$ 14,623.25	\$ 6,517.79	\$ (51.77)	\$ 83,563.52

Projected cash flows decline over the period of the analysis, beginning at \$14,761.01 in year one and declining to \$-51.77 in year ten. At first glance this seems contradictory to the net income results summarized in Table 3. However, it is actually an anticipated result and illustrates an important point: while cash flow is dependent on net income (loss), it is not the same as net income (loss). The formulas for net income and cash flow indicate the difference *and* the relationship between the two.

Formula for Net Income	Formula for Cash Flow
+ Revenues	+ Revenues
- Operating Costs	- Operating Expenses
- Interest Expense	- Annual Investment Payment
- Depreciation	(Interest Expense + Contribution to Principal)
Net Income Before Taxes	Cash Flows Before Taxes
- Taxes (Net Income Before Taxes * tax rate)	- Taxes (Net Income Before Taxes * tax rate)
Net Income After Taxes	Cash Flows After Taxes
-Dividends (Net Income After Taxes * dividend rate)	-Dividends (Net Income After Taxes * dividend rate)
Net Income After Taxes and Dividends Paid	Cash Flow

The relationship between net income and cash flow is driven by the difference between depreciation and principal of an investment and how they are accounted for in financial

statements. Cash flow measures actual cash revenues and expenditures. However, net income measures the profit generated from a given set of resources. Depreciation is a non-cash expense used to represent the decline in value of assets. This value is generally assumed to give a better accounting of the costs of owning and operating the assets (and business), and thus is used to represent that cost on the income statement. However, it is a non-cash expense and is not reflective of the actual cash inflows and outflows of the business, and thus cannot be included on the statement of cash flows. The annual investment payment represents the actual cash outflow resulting from ownership of the given assets. It is composed of the contribution to the principal portion of the investment (the initial investment less any contributions to principal) and interest expense.

Because the principal is paid down over the period of the analysis, the interest expense decreases and the contribution to principal increases with each payment. Depreciation is calculated using the straight-line method and therefore is constant over the period of the analysis. The result is that net income rises as interest expense decreases over the ten-year period. As net income increases, taxes and dividends also increase, resulting in increasing cash outflows as time passes. Given that revenues are not expected to increase over the time period, cash flows steadily decline over the period of the analysis.

While this effect may appear to be contradictory or a negative impact, it is actually a positive outcome. A lower net income in the first few years of operation results in fewer taxes paid in that year. While this is made up for as net income increases in the final years, deferring the amount of taxes paid to later years allows a business to have greater cash flows in the first years of operation when they are generally needed. However, it is important for business managers to be aware that cash flows will be smaller and potentially negative in the last years of the business, making it crucial to appropriately budget and manage early cash flows to cover any shortfalls that may occur in final years. Additionally, it is important to note that new investments will probably push this effect further into the future by approximately the same amount of time as the life of the investment.

Other Management Considerations

While economic feasibility is a key factor to the success of any entrepreneurial endeavor, it is not the one reason that start-up businesses succeed or fail. Economic feasibility assumes that all of the factors that contribute to the long-term sustainability of new business ventures are actively managed and controlled. Factors such as technical/operations management, marketing, legal documentation of business structure and organization, financial management, and risk assessment and management must all be sufficiently addressed to ensure success of the business in the long-term.

Technical/Operations Management

Good technical/operations background and expertise are crucial to any start-up business' success. The proposed redclaw aquaculture operation will be managed by LLC member-partner Neil Smeltzer, who has a long history in the operation and management of aquaculture facilities. His technical expertise and ability to problem-solve given limited resources and time will be a tremendous asset to the proposed operation.

Marketing

Whether or not there is a market willing to purchase the product at a price that returns above the cost of production and distribution will determine if the start-up business gets off the ground. Local restaurants have indicated they are willing to purchase product from Idaho Redclaw Farms, LLC. In addition, manager, Neil Smeltzer has negotiated an agreement with an established aquaculture products marketing firm to market his product into the Seattle fish market. The firm has an established relationship with the Seattle fish market through its own business, which markets a variety of specialty fish including trout, sturgeon, catfish, and tilapia. However, little market research has been done to this point that would indicate the volume and price the market would bear for a new product: redclaw crayfish. The economic feasibility analysis assumed that all of the volume would be consumed by the market at the price set by the producer. Verifying this information is critical to authenticating the results of the economic feasibility analysis. Also, the mix of product going to the Seattle fish market versus that going to the local restaurant trade should be determined before beginning full production and distribution.

Legal Documentation of Business Structure and Organization

Legally documenting the structure and organization of a start-up business forces entrepreneurs and investors to clarify and document their expectations, roles, responsibilities, and distribution of profits or loss. By doing this earlier, rather than later, start-up businesses can avoid costly and time consuming disputes over these issues that can ultimately cause a start-up business to fold. It is important to not be naïve going into business with others. Even partnerships between family or friends run the risk of having to settle a dispute at some point in time, usually under high stress. Starting-up a business is a period of high stress, and legal documentation provides an objective resource that can be a good resolution tool.

Furthermore, clearly documenting the business structure and organization is extremely important to the financial management of the business. In particular, how a business is organized and structured has significant tax implications. Discussing these with an accountant is recommended. A Limited Liability Company (LLC) can file as a partnership or as a corporation. Both have advantages and disadvantages. Determining the best fit for the business is important and should be considered. Settling these issues prior to beginning production will be helpful in the future. In order to address all issues (which the entrepreneurs and investors may not have thought of), consulting with an attorney and accountant or financial advisor while completing this process is recommended.

Financial Management

Good financial management is critical to the success of any business, established or start-up. While an accountant can be retained and consulted to address big-picture issues, such as those mentioned above, relying on an accountant to handle day to day financial matters can be costly. Handling sales, collection of accounts receivable, payment on accounts payable, etc. can be done in-house. In the proposed aquaculture operation, a good office manager could attend to marketing and sales management *and* financial management. While keeping the books may seem tedious, it is extremely important to the long-term success of the business.

One example of the importance of good financial management can be seen in the implications different depreciation methods have for financial and tax considerations. For example, if MACRS depreciation (Internal Revenue Service accelerated depreciation schedule) is used, net income will be significantly less in the first years and greater in the final years of the investment. As a result, taxes are deferred to later years, during which a profit is generated. This results in greater cash flows in the first years of operation, but negative cash flows near the end of the life of the investment. Such considerations need to be addressed to determine the best way to deal with such financial management decisions.

Risk Assessment and Management

Managing risk associated with both production and marketing will be important for the proposed redclaw aquaculture operation. Disease poses a significant production risk. There are no approved treatments for redclaw crayfish that contract native diseases and infections, which can wipe-out entire populations of crayfish. This makes prevention the major production risk management tool. The proposed operation is able to address disease prevention in a more cost-effective manner because it utilizes a geothermal resource as its energy/heat supplier. Freshwater circulates in a closed system through the culture tanks and is cleaned using biofilters. The freshwater is brought to temperature by the geothermal water through a heat-exchange process. The entire production area is enclosed and heated using the geothermal resource. The fresh-water closed system and enclosed production area eliminate the two primary sources of disease contamination: contaminated water in culture systems and fecal droppings from birds that consumed diseased native crayfish. However, it is not out of the realm of possibility that disease could impact the proposed aquaculture facility.

Marketing concerns also pose significant risks: 1) uncertain and undefined market, 2) food safety concerns, and 3) competition. Very little market research has been done to determine the volume and price of redclaw crayfish that the targeted markets will bear. Until this is completed and production and sales have commenced this will continue to be a significant source of risk.

Second, as the only supplier of redclaw crayfish to the selected markets, any food-borne illnesses contracted from the redclaw crayfish will be directly traced back to the distributor and/or producer. The cost of recalling and disposing of contaminated product can be more than a small business can bear without a good recall plan and insurance in place. It is recommended that a plan be developed for this occurrence. It is likely that the plan will never be implemented or put to use, but in the event that it is needed, it is better to have a plan in place than to create one in the midst of crisis. Furthermore, having a thorough plan in place reduces liability and cost.

Finally, competition from other producers poses a potential risk. However, Idaho Redclaw Farms, LLC will be the only redclaw crayfish operation licensed in the state. Also, the proximity to a geothermal resource provides a significant cost advantage. Therefore, it appears that there is little risk of increased competition in the market at this point.

Sensitivity Analysis

A sensitivity analysis is a useful tool to examine how risk and uncertainty can affect the bottom-line of a business. A spreadsheet model was developed to determine the feasibility of the proposed aquaculture operation and can be easily applied in a sensitivity analysis. A brief

instruction manual and the spreadsheet model are included in Appendix C. The model can be used to complete a sensitivity analysis for those cost and revenue considerations that have considerable risk and uncertainty associated with them. For example, by reducing production by half in one year, it is possible to simulate the effects on the profitability of the business if disease was introduced in one year to a portion of the productive population. Another example might be varying feed or fuel expenses and identifying how variations in cost items affect the bottom line.

Conclusions

The initial economic feasibility analysis indicates that the proposed aquaculture operation will be profitable in both the short and long-term and will generate sufficient cash flows to operate. However, the business does not generate market rates of return, which might create a sufficient cushion for the risks inherent in producing a new product and starting-up a new business. Furthermore, the analyses were based on a number of assumptions given the uncertainty surrounding the proposed operation at the time of the study. In particular, the following two major assumptions have significant implications for the feasibility of the operation: 1) the market will absorb all of the production at the price set by Idaho Redclaw Farms, LLC and 2) there will be no introduction of native crayfish diseases to the cultured redclaw crayfish. For example, if disease is introduced in only one year of the study and half of the normal production is lost, the operation becomes infeasible in both the short and long-term.

It will be important to the long-term success of the proposed redclaw crayfish farm that the management issues raised in this analysis be addressed in the early stages of the business development. One way to address and document these management and marketing issues *as well as* the economic feasibility of the proposed operation effectively is to complete a business plan. In addition, if capital investments are going to be financed, a business plan will be required by lending institutions. Local Small Business Development Centers can be very helpful in assisting small businesses and entrepreneurs to develop a thorough business plan.

- *A primer from the Idaho Small Business Development Center on developing and writing a business plan will accompany this report. Developing Your Business Plan can be found online at http://www.idahosbdc.org/bizessentials_planning.html.⁷*

REFERENCES

1. Masser, Michael P. and David B. Rouse. Australian Red Claw Crayfish. Southern Regional Aquaculture Center. SRAC Publication No. 244. Pages 1-2. April 1997.
2. Masser, Michael P. and David B. Rouse. Australian Red Claw Crayfish. Southern Regional Aquaculture Center. SRAC Publication No. 244. Page 4. April 1997.
3. Smeltzer, Neil. Interview with University of Idaho personnel. July 14, 2004.
4. Rafferty, Kevin. Freshwater Aquaculture Geothermal Feasibility Study: Raft River, ID. Idaho Department of Water Resources – Energy Division. July 2004.
5. Farm-2-Market.com. <http://www.f2m.com/order.html>. September 30, 2004.
6. Smeltzer, Neil. Interview with University of Idaho personnel. September 16, 2004.
7. Idaho Small Business Development Center. Developing Your Business Plan. http://www.idahosbdc.org/bizessentials_planning.html. September 30, 2004.

APPENDIX A: COST AND REVENUE ESTIMATE DEVELOPMENT

INVESTMENT COSTS	Cost Factor	Square Feet	Cost	Source	Contingency Factor	Estimate
Tank and Filtering Structures	<i>Sum costs of required structures for repro/hatchery and growout.</i>					\$ 44,000.00
Repro/Hatchery	<i>na</i>	<i>na</i>	\$ 15,000.00	Smeltzer	10%	\$ 16,500.00
Growout	1.79	13,800	25000	Smeltzer	10%	\$ 27,500.00
Planned Buildings	<i>Sum costs of used greenhouses and new Aqua Care greenhouse.</i>					\$101,200.00
2 Used Greenhouses	<i>na</i>	<i>na</i>	\$ 12,000.00	Smeltzer	10%	\$ 13,200.00
Aqua Care Greenhouse	8.00	10,000	\$ 80,000.00	Aqua Care	10%	\$ 88,000.00
Existing Building Renovation (completed)	<i>na</i>	<i>na</i>	\$ 20,000.00	Smeltzer	<i>na</i>	\$ 20,000.00
Geothermal Heating Structures (contingency included in factor)*	9.28	15,300	\$141,984.00	Rafferty/Smeltzer	<i>na</i>	\$141,984.00
Truck and Trailer			\$ 40,000.00	UI Estimate	<i>na</i>	\$ 40,000.00
Total Capital Investment Costs						\$347,184.00
* The geothermal heating structures cost factor is higher than appears in the engineering study. The difference between the two factors comes from the difference between the estimated and actual investment cost required for the first 2500 square feet of the facility. The actual cost of \$23,200 for the 2500 square foot area is the amount that was used in the estimate.						
Revenue Considerations	Formula		Value	Source	Contingency	Estimate
Gross Receipts from Sales of Redclaw Crayfish	Production * Retail Price				<i>na</i>	\$276,000.00
Production		13800 lbs		Smeltzer	<i>na</i>	
Retail Price		\$ 20.00		Farm-2-Market	<i>na</i>	
Less Marketing and Distribution Costs		\$ 5.00		Smeltzer	<i>na</i>	\$ 69,000.00
Farm Receipts from Sales of Redclaw Crayfish						\$207,000.00
Operating Cost Considerations						
Lease	<i>na</i>		\$ 36,000.00	Smeltzer	<i>na</i>	\$ 36,000.00
Utilities	<i>phone/electric + geothermal</i>		\$ 9,600.00		5%	\$ 10,080.00
Phone/Electric	<i>na</i>		\$ 7,200.00	Smeltzer		
Geothermal	<i>na</i>		\$ 2,400.00	Smeltzer		
Maintenance	<i>filtering + geothermal system</i>		\$ 3,720.00		5%	\$ 3,906.00
Filtering System			\$ 880.00	UI Estimate		
Geothermal System			\$ 2,840.00	Rafferty		
Hired Labor	<i>wages + employment taxes</i>		\$ 24,545.98		<i>na</i>	\$ 24,545.98
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	<i>1.5 jobs at \$7hr*40hr/wk</i>		\$ 21,840.00	Smeltzer		
Employment Taxes	<i>FICA + worker's comp</i>		\$ 2,705.98	Idaho State Government		
Management	<i>salary + employment taxes</i>		\$ 39,336.50		<i>na</i>	\$ 39,336.50
Management Salary	<i>na</i>		\$ 35,000.00			
Employment Taxes	<i>FICA + worker's comp</i>		\$ 4,336.50	Idaho State Government		
Feed	<i>na</i>		\$ 2,400.00	Smeltzer	5%	\$ 2,520.00
Fuel	<i>40,000 m/yr, 14mpg, \$2/gal</i>		\$ 6,000.00	UI Estimate	5%	\$ 6,300.00
Breeding Stock Replenishment	<i>na</i>		\$ 200.00	Smeltzer	5%	\$ 210.00
Insurance	<i>na</i>		\$ 3,000.00	Smeltzer	5%	\$ 3,150.00
Attorney Fees	<i>na</i>		\$ 3,000.00	Smeltzer	5%	\$ 3,150.00
Permits and Licensing	<i>na</i>		\$ 200.00	Smeltzer	5%	\$ 210.00
Total Operating Costs						\$129,408.48

APPENDIX B: PROJECTED INCOME STATEMENTS

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR ONE
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,300	0.24
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,421	0.10
TOTAL OPERATING COSTS	129,723	9.40
3. INCOME ABOVE OPERATING COSTS	77,277	5.60
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	34,718	2.52
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	65,393	4.74
5. NET INCOME BEFORE TAXES	11,884	0.86
6. TAXES	4,159	0.30
7. NET INCOME AFTER TAXES	7,725	0.56
8. CASH DIVIDENDS TO PARTNERS	1,854	0.13
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	5,871	0.43

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR TWO
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	32,540	2.36
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	63,215	4.58
5. NET INCOME BEFORE TAXES	14,377	1.04
6. TAXES	5,032	0.36
7. NET INCOME AFTER TAXES	9,345	0.68
8. CASH DIVIDENDS TO PARTNERS	2,243	0.16
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	7,102	0.51

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR THREE
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	30,144	2.18
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	60,818	4.41
5. NET INCOME BEFORE TAXES	16,774	1.22
6. TAXES	5,871	0.43
7. NET INCOME AFTER TAXES	10,903	0.79
8. CASH DIVIDENDS TO PARTNERS	2,617	0.19
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	8,286	0.60

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR FOUR
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	27,508	1.99
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	58,182	4.22
5. NET INCOME BEFORE TAXES	19,409	1.41
6. TAXES	6,793	0.49
7. NET INCOME AFTER TAXES	12,616	0.91
8. CASH DIVIDENDS TO PARTNERS	3,028	0.22
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	9,588	0.69

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR FIVE
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	24,608	1.78
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	55,283	4.01
5. NET INCOME BEFORE TAXES	22,309	1.62
6. TAXES	7,808	0.57
7. NET INCOME AFTER TAXES	14,501	1.05
8. CASH DIVIDENDS TO PARTNERS	3,480	0.25
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	11,021	0.80

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR SIX
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	21,419	1.55
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	52,093	3.77
5. NET INCOME BEFORE TAXES	25,498	1.85
6. TAXES	8,924	0.65
7. NET INCOME AFTER TAXES	16,574	1.20
8. CASH DIVIDENDS TO PARTNERS	3,978	0.29
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	12,596	0.91

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR SEVEN
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	17,911	1.30
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	48,585	3.52
5. NET INCOME BEFORE TAXES	29,007	2.10
6. TAXES	10,152	0.74
7. NET INCOME AFTER TAXES	18,854	1.37
8. CASH DIVIDENDS TO PARTNERS	4,525	0.33
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	14,329	1.04

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR EIGHT
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	14,051	1.02
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	44,726	3.24
5. NET INCOME BEFORE TAXES	32,866	2.38
6. TAXES	11,503	0.83
7. NET INCOME AFTER TAXES	21,363	1.55
8. CASH DIVIDENDS TO PARTNERS	5,127	0.37
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	16,236	1.18

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR NINE
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	9,806	0.71
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	40,481	2.93
5. NET INCOME BEFORE TAXES	37,111	2.69
6. TAXES	12,989	0.94
7. NET INCOME AFTER TAXES	24,122	1.75
8. CASH DIVIDENDS TO PARTNERS	5,789	0.42
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	18,333	1.33

**IDAHO REDCLAW FACILITY
PROJECTED INCOME STATEMENT
YEAR TEN
15,300 SQUARE FEET**

	VALUE	VALUE/LB PRODUCED
1. GROSS RECEIPTS		
RECEIPTS FROM SALES OF REDCLAW CRAYFISH	276,000	
Production	13,800	
Retail Price		20
LESS MARKETING & DISTRIBUTION COSTS	69,000	5
FARM RECEIPTS FROM SALES OF REDCLAW CRAYFISH	207,000	15
2. OPERATING COSTS		
LEASE	36,000	2.61
UTILITIES	9,600	0.70
Phone/Electric	7,200	0.52
Geothermal	2,400	0.17
MAINTENANCE	3,720	0.27
Filtering System	880	
Geothermal System	2,840	
HIRED LABOR	24,546	1.78
Hired Labor (1.5 jobs at \$7/hr*40hr/wk)	21,840	
Employment Taxes (FICA and Workers Comp)	2,706	
MANAGEMENT	39,337	2.85
Management Salary	35,000	2.54
Employment Taxes (FICA and Workers Comp)	4,337	0.31
FEED	2,400	0.17
FUEL	6,000	0.43
BREEDING STOCK REPLENISHMENT	200	0.01
INSURANCE	3,000	0.22
ATTORNEY FEES	3,000	0.22
PERMITS AND LICENSING	200	0.01
CONTINGENCY	1,406	0.10
TOTAL OPERATING COSTS	129,408	9.38
3. INCOME ABOVE OPERATING COSTS	77,592	5.62
4. OWNERSHIP/INVESTMENT COSTS		
INTEREST EXPENSE	5,137	0.37
DEPRECIATION	30,675	2.22
TOTAL OWNERSHIP/INVESTMENT COSTS	35,811	2.60
5. NET INCOME BEFORE TAXES	41,781	3.03
6. TAXES	14,623	1.06
7. NET INCOME AFTER TAXES	27,157	1.97
8. CASH DIVIDENDS TO PARTNERS	6,518	0.47
9. NET INCOME AFTER TAXES AND DIVIDENDS PAID	20,640	1.50

APPENDIX C: FEASIBILITY MODEL INSTRUCTIONS

A spreadsheet model was developed to determine the feasibility of the proposed redclaw crayfish aquaculture operation. The spreadsheet model allows changes to be made to the inputs on a data entry page to examine how input variations will affect the feasibility and profitability of the operation. A brief explanation of how to use the spreadsheet model follows.

Changing Input Values:

- All white cells are input cells that can be varied according to the operator's judgment.
- The input being changed corresponds to the item identified in the leftmost column that corresponds to the row of the cell being changed.
- The analysis extends over ten years. Inputs can be changed for any year or for all years, according to the analysis and operator judgement. The year applying to the input is identified in the topmost row of the column corresponding to the cell being changed.
- Green cells are input cells that can be varied. The cells should not be changed unless there is existing evidence that the maintenance cost estimates are incorrect. The estimates were developed based on standard maintenance cost factors for the investments being made.
- Bold cells will be conveyed as is directly as an input entry. Cells in regular fonts will be used in calculations to determine the value to be conveyed into the investment and feasibility analysis model.

Returning to Original Values

- To return to the original values developed in the feasibility model, click on the "Return to Default Values" button. This will restore all original values.

Navigating the Model

- Below the data entry worksheet are buttons that will take the operator to all report pages, which can in turn be printed for each scenario the model is run for.
- Once on a page other than the data entry page, there is a button at the bottom of the report called "Return to Data Entry" which can be clicked on to return the operator to the data entry page. From the data entry page, the user can select the next report to view.
- Operators familiar with Microsoft Excel can navigate the model like any other workbook.

Cautions and Considerations

- Determining how different inputs will affect the operation is best achieved by changing only one input at a time and keeping the remaining inputs constant. This allows the user to clearly identify the importance of each variable on all aspects of feasibility and profitability.
- The model was developed for the facility sized at 15,300 square feet. All changes in inputs should correspondingly be for the 15,300 square foot size.
- All worksheets in the spreadsheet model are locked. This means that only those cells and items selected to allow for editing can be changed. If changes to the spreadsheet model beyond changes to inputs are necessary, worksheets can be unlocked by clicking on Tools|Protection|Unprotect sheet. Similarly, they can be re-locked by clicking on Tools|Protection|Protect Sheet.